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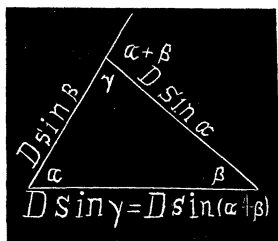
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Likewise it seems desirable to supplement the usual analytic derivation of  $\tan \frac{1}{2}A = r/(s-a)$  by a purely geometric proof (MONTHLY, 1902, p. 36).



**Theorem.** *The compound of a sphere on the diameter  $OP$  with a sphere on the diameter  $OR$  is a sphere having as diameter the diagonal  $OQ$  of the parallelogram  $OPQR$ .*

The proof is similar to the above for circles. If three parallel planes make equal intercepts on one transversal they make equal intercepts on any other transversal.

## DEPARTMENTS.

### SOLUTIONS OF PROBLEMS.

#### ALGEBRA.

228. Proposed by G. W. GREENWOOD, M. A. (Oxon), Professor of Mathematics, McKendree College, Lebanon, Ill.

Sum the infinite series

$$\frac{1}{11.13} + \frac{1}{23.25} + \frac{1}{35.37} + \frac{1}{47.49} + \frac{1}{59.61} + \dots \quad [\text{Oxford, 1895}].$$

Solution by the PROPOSER.

We can show that\*

$$\frac{1}{2\theta} \left[ \frac{1}{\theta} - \cot \theta \right] = \frac{1}{(\pi - \theta)(\pi + \theta)} + \frac{1}{(2\pi - \theta)(2\pi + \theta)} + \frac{1}{(3\pi - \theta)(3\pi + \theta)} + \dots$$

Put  $\theta = \pi/12$  and we get

$$\frac{\pi}{6} \left[ \frac{12 - \pi \cot 15^\circ}{\pi} \right] = \frac{144}{\pi^2} \left[ \frac{1}{11.13} + \frac{1}{23.25} + \dots \right].$$

Hence the required sum  $= \frac{12 - \pi \cot 15^\circ}{24}$ .

Also solved by J. Scheffer.

229. Proposed by B. F. YANNEY, Mount Union College, Alliance, O.

If  $a_1^n + a_2^n + a_3^n + \dots + a_r^n = A^n$ ,  $a_1^m + a_2^m + a_3^m + \dots + a_r^m >$  or  $< A^m$ , according as  $m <$  or  $> n$ ; provided all the letters stand for positive real numbers.

No satisfactory solution has been received.

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\*Expand  $\sin \theta$  in factors, take logarithms of each expression, and differentiate.